

REMARKS/ARGUMENTS**A. Status of the Application**

Claims 1-36 and 51-55 are pending. Claims 51-54 are allowed, and claims 13 and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form. Claims 1-12, 14-30, 32-36 and 55 are rejected.

The issues outstanding for this application is as follows:

- Claims 1, 3-6, 10-12, 14, 16-19, 21-24, 28-30, and 34-36 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 4,561,905 (“Kittle”).
- Claims 7-9, 15, 25-27, 32, and 55 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kittle (U.S. Patent No. 4,561,905).
- Claims 2 and 20 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kittle in view of U.S. Patent No. 3,808,020 (“Pitchford”).

B. Claims are Not Anticipated by Kittle

Claims 1, 3-6, 10-12, 14, 16-19, 21-24, 28-30, and 34-36 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Kittle (U.S. Patent No. 4,561,905). Applicants respectfully disagree.

Kittle teaches methods for suppressing coal dust by diluting an emulsion with water, (wherein the emulsion comprises a surfactant, water, and oil), thereby forming a foam of the diluted emulsion and then applying the foam to a falling mass of coal (see the abstract and claim 1, for example). The oil can include asphalt cut-back (col. 2, line 29). The invention pertains to a falling mass of coal either at a mine face or at a conveyor transfer point, and the coating that the foam forms on the coal prevents the escape of dust even at locations remote from the foam application location (col. 1, lines 5-15):

The composition differs from conventional foamable compositions used for this purpose [suppression of coal dust] in that it forms a coating on the coal which prevents the escape of dust at locations remote from the locations of foam applications.

Applicants assert that this does not teach Claim 1 or any of its dependents.

Applicants’ invention regards generation of an atomized asphalt emulsion spray for

application into coal fines. Specifically, Applicants' invention teaches on page 7, lines 6-9:

The present invention provides multiple improvements including the ability to continually mix heated asphalt and a soapy water mixture to create an emulsion characterized by very small asphalt droplets and to apply same uniformly to coal fines in the production of synfuel.

And, on page 7, lines 16-21:

Additionally, the emulsion form of asphalt divides the asphalt into extremely fine particles with very high surface area. This fine division, along with the relatively low viscosity of the emulsion facilitates spreading the binder much more uniformly across the surface of the coal fines, increasing interfacial contact between coal and binder. Increased interfacial contact between the binder and coal results in increased levels of chemical reaction and more efficient use of binder.

And, also, on page 7, lines 28-29:

Finally, a method of applying the emulsion of the invention to the coal fines by aerosolization, or atomization, also results in lower cost to produce synfuel.

This is contrary to the teaching of Kittle, which states in column 2, lines 16-21:

The reason for this [a high degree of tackiness at wide temperature range] is that the application of foam to the falling coal leaves a film of oil on the coal after evaporation of water. The tackiness of the film causes fine dust particles to adhere to the film rather than escape into the atmosphere when the coal is agitated during handling.

Kittle also teaches (col. 2, lines 24-26):

An important characteristic of the oil is that it should not be absorbable to any appreciable extent by the coal. Absorption would destroy the film.

Thus, where Applicants teach an atomized stream transferred onto coal fines, wherein the atomized particles are so small that they can get into the coal fines for binding to the coal particles, Kittle alternatively teaches applying a frothy broth film over coal fines to suppress dust. This is opposite from Applicants' invention wherein at microscopic levels the atomized spray of Applicants' invention binds with the individual coal particles for chemical reaction, as opposed to providing a film over the mass of coal fines. Kittle is trying to control dust and is not directed to atomizing an emulsion spray to be applied to the agitated coal fines.

Furthermore, there is no teaching that Kittle utilizes an *atomizer* nor adds a

motivating gas into an atomizer to form an asphalt *atomized spray*. That is, according to column 3, lines 38-62, Kittle teaches forcing the liquid/surfactant mixture through a restricted passage at a high pressure, and downstream of this point air is injected into the mixture for the purpose of generating foam or bubbles. This teaches a means for injecting air into the emulsion, but does not necessarily teach an atomizer. This is in contrast to Applicants' claimed invention. The specification states: "The use of an air atomizer of the invention is in contrast to pump atomizers utilized in the art, which force liquid through a small orifice. A variety of commercially available air atomizers are generally known but have not been used for the purpose of introducing an asphalt emulsion to coal fines for the manufacture of a synfuel." (Page 17, Lines 12-15).

Thus, there is no indication that Kittle utilizes an atomizer, and there is no indication that from an atomizer Kittle provides an atomized stream of emulsion and gas, particularly given that the mixture resulting from the injected air into the liquid/surfactant mixture in Kittle is in fact a foam. Foam or bubbles are not aerosolized or atomized spray, so this element is not provided in Kittle. The American Heritage College Dictionary, 3rd Edition, defines foam as "a mass of bubbles of air or gas in a matrix of liquid film, esp. an accumulation of fine frothy bubbles formed in or on the surface of a liquid..." and defines spray as "water or other liquid moving in a mass of dispersed droplets; a fine jet of liquid discharged from a pressurized container,...such as an atomizer." In fact, foam would be deleterious to Applicants' invention: "Preferably, lines (44) and (62) extend below the liquid level of the tank to prevent the formation of excessive foaming of the mixture"; Page 12, Lines 15-16).

Utilizing an atomizer to provide aerosolization of the emulsion mixture is an advantage to Applicants' invention. In the specification on Page 22, Lines 20-27 it states:

The emulsion of the present invention has greater adhesion and more uniform consistency than other emulsions in the art. That is, the emulsion has greater adhesion because it adheres to the surface of the coal more strongly than emulsions standard in the art due to both the method of making the emulsion and the method of applying the emulsion to the coal fines by aerosolization, or atomization. The emulsion of the invention has a more uniform consistency than other emulsions because there are more evenly dispersed particles of the asphalt suspended within the emulsion due to the method of making the emulsion as described herein.

Applicants assert that the purpose of an atomizer is to separate the liquid into many fine, distinct droplets, each with very high surface area. In the present invention, this increases the reactivity of the liquid with the coal fines. The gas phase is the continuous phase, and the liquid phase is the discrete (non-continuous) phase.

By contrast, in a foam, the liquid phase is continuous, and the air bubbles entrapped in the foam are the discrete phase. A simple comparison would include hair spray (atomized liquid) vs. foamy shaving cream (a foam); both contain gaseous and liquid components, but both are *very* different in physical properties.

Kittle is teaching the use of a foam exclusively, since he desired a continuous liquid phase to entrap coal dust particles, largely by physical means. In contrast, the present invention is directed to a dis-continuous liquid phase with discrete ultra-fine droplets that will penetrate micro-cracks in the coal fines and react with coal fines to form a synfuel.

Furthermore, the mechanical apparatus used for generating a foam is different from that used to generate an atomized liquid. The former introduces air *after* the restriction orifice (*i.e. after* the high sheer zone) to minimize disruption of the liquid film, while the latter introduces air (or other motivating gas) *into* the high sheer zone to promoter shearing and dispersion of the liquid phase into very small droplets.

Thus, the mechanism by which the gas and emulsion are mixed are different in Kittle compared to Applicants' invention. Kittle adds the gas **into** the emulsion mixture, whereas in Claim 1 Applicants pass the emulsion into the atomizer and then add the gas to the atomizer from which the asphalt atomized spray is generated. That is, in Kittle the emulsion is expelled at high velocity from a restricted passage **before** the gas is injected into it downstream, and in Applicants invention the gas and emulsion are introduced into the atomizer and expelled from the atomizer together as an atomized spray.

Other differences exist between Kittle and the present invention. For example, Kittle teaches the use of *lots* of surfactant (a minimum of 4% based on the triangle plot of the Figure) to produce lots of bubbles. This is a *very large* amount of surfactant, but is necessary to create a foam. The present invention prefers less than 4% surfactant, and strives to avoid generating bubbles and foam.

Kittle prefers surfactants with "good foaming capabilities", whereas the present invention prefers surfactants that do NOT foam. Also, Kittle teaches forming an emulsion

and then diluting it with water, wherein a minimum dilution is 5 parts of water to 1 part of emulsion. The present invention simply forms an emulsion and creates an aerosol spray without further dilution.

Thus, Claim 1 and its dependents are not anticipated by Kittle because Kittle does not teach applying an atomized stream of emulsion for injection into coal fines, does not teach an atomizer, and does not teach adding to said atomizer a motivating gas to form an asphalt atomized spray. Therefore, Claim 1 and its dependents are not anticipated by Kittle, and Applicants respectfully request removal of this rejection.

Kittle also does not teach Claim 19 or its dependents. Claim 19 regards, “introducing a motivating gas into an atomizer; introducing an oil-in-water asphalt emulsion into said atomizer; creating in said atomizer an atomized stream of emulsion and gas...”. Kittle does not teach this. As stated above, Kittle teaches forcing the liquid/surfactant mixture through a restricted passage at a high pressure, and downstream of this point air is injected into the mixture for the purpose of generating foam. Applicants’ invention in claim 19 requires an atomized stream, of which foam or bubbles is not. Furthermore, there is no indication that Kittle utilizes an atomizer, and there is no indication that a motivating gas is introduced into an atomizer or that from an atomizer Kittle provides an atomized stream of emulsion and gas, particularly given that the mixture resulting from the injected air into the liquid/surfactant mixture in Kittle is in the form of a foam or bubbles.

Finally, the mechanism by which the gas and emulsion are mixed are different in Kittle compared to Applicants’ invention. Kittle adds the gas **into** the emulsion mixture, whereas in claim 19 Applicants introduce the gas into the atomizer, introducing the emulsion into the atomizer, create in the atomizer an atomized stream of emulsion and gas, and then spray the atomized stream of emulsion and gas. That is, in Kittle the emulsion is expelled at high velocity from a restricted passage **before** the gas is injected into it downstream, and in Applicants invention the gas and emulsion are introduced into the atomizer and expelled from the atomizer together as an atomized spray.

Therefore, Claim 19 and its dependents are not anticipated by Kittle, and Applicants respectfully request removal of this rejection.

C. Claims are Not Unpatentable over Kittle

Claims 7-9, 15, 25-27, 32, and 55 are rejected under 35 U.S.C. § 103(a) as allegedly

being unpatentable over Kittle. Applicants respectfully disagree.

Given that Kittle does not teach nor suggest applying an atomized spray for injection into coal fines for binding with particles, does not teach or suggest an atomizer, does not teach or suggest formation of an asphalt aerosol spray (claims 7-9, 15, 55), and does not teach or suggest the generation of an atomized stream of emulsion and gas (claims 25-27, 32), Applicants respectfully assert that the claims are not obvious.

Furthermore, Kittle teaches an asphalt emulsion foam applied to falling coal fines to suppress coal dust, which Applicants strongly assert does not render obvious atomization of an asphalt emulsion stream for providing to the coal fines, particularly for binding of the emulsion atomization to the coal particles. Thus, Kittle teaches away from the present invention.

Kittle also teaches away by teaching the generation of foam or bubbles. Foam is not an aerosol spray and teaches away from Applicants' invention of advantageously requiring an aerosol spray. Applicants reiterate that foam would be deleterious to Applicants' invention: "Preferably, lines (44) and (62) extend below the liquid level of the tank to prevent the formation of excessive foaming of the mixture"; Page 12, Lines 15-16, and original claim 6).

Furthermore, Applicants note that Kittle teaches away from the present invention by stating that an object of the invention is to provide application to coal of an agent that is stable in storage (col. 1, Lines 54-59). This teaches away from Applicants' invention, given that the presently claimed process is one that is an integral, continuously operating one (Page 3, Lines 9-11; Page 7, Lines 2-5)

Therefore, Applicants assert that the claimed invention is not obvious over Kittle and respectfully request that the Examiner removes the rejection of claims 7-9, 15, 25-27, 32, and 55.

D. Claims are Not Unpatentable over Kittle in view of Pitchford

Claims 2 and 20 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kittle in view of Pitchford. Applicants respectfully disagree.

As argued above, Kittle by itself does not make obvious Applicants' invention. Applicants assert that Kittle in view of Pitchford also does not render Applicants' invention obvious. Kittle does not teach nor suggest all elements of the claimed invention, nor does it suggest it, and the combination of Kittle and Pitchford also does not teach or suggest the

claimed invention. Neither references teach or suggest an atomizer, teach or suggest formation of an asphalt aerosol spray, or teach or suggest the generation of an atomized stream of emulsion and gas. Pitchford simply teaches the making of an asphalt emulsion and teaches nothing about aerosols, application, *etc.* to which the pending claims are directed.

If one reference teaches away from Applicants' invention, then the combination with another reference will also teach away from the invention. Nevertheless, Pitchford by itself would also teach away from Applicants' claimed invention. As stated in column 2, lines 2-7, Pitchford's process provides an emulsion that has exceptional qualities upon storage. As noted above, Applicants' emulsion is used in a continuous process being inherently unnecessary for storing of the emulsion. Therefore, Kittle and Pitchford separately and in combination teach away from the pending claims.

Furthermore, there is no motivation to combine Kittle with Pitchford, as they are related to different concepts. Although they both regard the broad area of asphalt binders, Kittle is directed to creation of a film to suppress dust from falling coal fines, and there is no motivation to combine this with respect to Pitchford's teaching of a tight size distribution of asphalt particles in an emulsion. Neither Pitchford or Kittle teaches applicability to either of the respective processes. That is, there is no indication to reduce particle size in Kittle, and there is no indication in Pitchford to use smaller more uniform particles to suppress coal dust. The Examiner is improperly relying on hindsight to combine these references.

Therefore, Applicants respectfully request removal of the rejection of claims 2 and 20 over Kittle in view of Pitchford.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 06-2375, under Order No. HO-P01944US1 from which the undersigned is authorized to draw.

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Respectfully submitted,

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